SOLAR/1030-79/01

Monthly Performance Report

CHESTER WEST

JANUARY 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

MONTHLY PERFORMANCE REPORT

CHESTER WEST

JANUARY 1979

I. SYSTEM DESCRIPTION

The Chester West site is a single-family residence in Huntsville, Alabama. Solar energy is used for space heating the home and preheating domestic hot water (DHW). The solar energy system has an array of flat-plate collectors with a gross area of 225 square feet. The array faces south at an angle of 49 degrees to the horizontal. A glycerol-water solution is used as the medium for delivering solar energy from the collector array to storage, and water is the medium for delivering solar energy from storage to the space heating and hot water loads. Solar energy is stored aboveground in a 500-gallon water storage tank. Auxiliary space heating is provided by an air-to-air heat pump and electrical heating elements which are designed to function in parallel with the solar energy space heating loop. Auxiliary hot water heating is provided in series with the solar energy hot water heating loop through the use of electrical heating elements in an 80-gallon DHW tank. The system, shown schematically in Figure 1, has three modes of solar operation.

Mode 1 - Collector-to-Storage: This mode activates when the control system senses a sufficient temperature difference between the collector and storage and remains active until the temperature difference drops below the accepted minimum. The collected energy is transferred to storage through a ring-type, liquid-to-liquid heat exchanger located in the storage tank. Pump P1 is operating.

Mode 2 - Storage-to-Space Heating: This mode activates when there is a demand for space heating. Solar energy is circulated to the conditioned space by solar heated water from storage through a liquid-to-air heat exchanger located in the air-distribution duct. Pump P3 is operating.

Mode 3 - Storage-to-DHW Tank: This mode activates when the control system senses a sufficient temperature difference between storage and the DHW tank, and remains active as long as a sufficient difference exists. Water circulates from the top of storage through a liquid-to-liquid heat exchanger located in the bottom of the DHW tank. Pump P2 is operating.

II. PERFORMANCE EVALUATION

INTRODUCTION

The site was occupied in January and the solar energy system operated continuously during the month. Solar energy satisfied 6 percent of the space heating requirements. In supporting the space heating requirements, the solar energy system provided electrical energy savings of 0.41 million Btu. The solar energy system also supported the DHW subsystem during the month. However, a

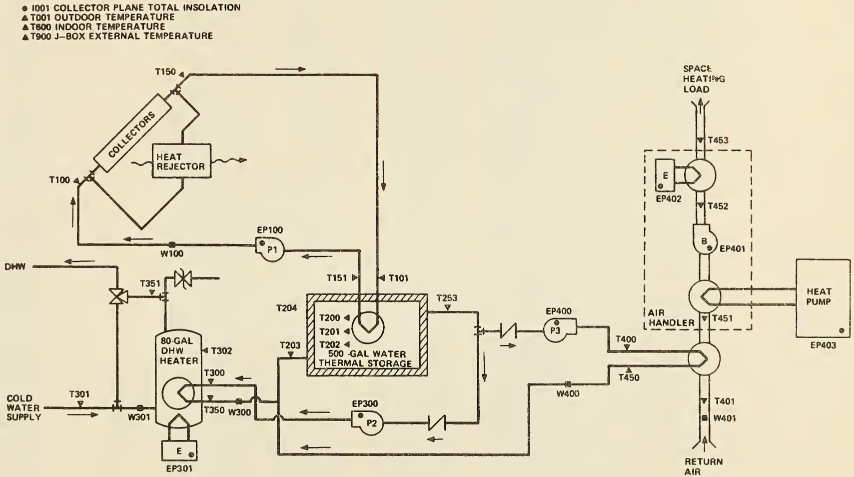

Figure 1. CHESTER WEST SOLAR ENERGY SYSTEM SCHEMATIC

problem with the sensor measuring the flow of solar heated water from storage to the DHW subsystem produced invalid data. This problem invalidated many performance factors of the DHW and storage subsystems.

WEATHER CONDITIONS

During the month, total incident solar energy on the collector array was 5.1 million Btu for a daily average of 728 Btu per square foot. This was below the estimated average daily solar radiation for this geographical area during January of 1002 Btu per square foot for a south-facing plane with a tilt of 49 degrees to the horizontal. The average ambient temperature during January was 34°F as compared with the long-term average for January of 41°F. The number of heating degree-days for the month (based on a 65°F reference) was 973, as compared with the long-term average of 747.

THERMAL PERFORMANCE

Collector - The total incident solar radiation on the collector array for the month of January was 5.1 million Btu. During the period the collector loop was operating, the total insolation amounted to 4.0 million Btu. The total collected solar energy for the month of January was 2.0 million Btu, resulting in a collector array efficiency of 39 percent, based on total incident insolation. Solar energy delivered from the collector array to storage was 1.8 million Btu. Energy loss during transfer from the collector array to storage was 0.2 million Btu. This loss represented 10 percent of the energy collected. Operating energy required by the collector loop was 0.16 million Btu.

Storage - Solar energy delivered to storage was 1.8 million Btu. There were 0.77 million Btu delivered from storage to the space heating subsystem. The average storage temperature for the month was 84°F.

DHW Load - The DHW subsystem consumed an unknown amount of solar energy and 0.66 million Btu of auxiliary electrical energy to satisfy a hot water load of 0.39 million Btu. The DHW subsystem consumed a total of 0.12 million Btu of operating energy. A daily average of 17 gallons of DHW was consumed at an average temperature of 140°F delivered from the tank.

Space Heating Load - Six percent of the 13.4 million Btu space heating load was satisfied by 0.77 million Btu of solar energy. An auxiliary electrical heat pump and resistance heater used 11.5 million Btu of electrical energy to satisfy the remaining 12.6 million Btu space heating load. This auxiliary requirement indicated a heat pump operating below its optimum performance level with most of the auxiliary support coming from the resistance heater. The space heating subsystem consumed a total of 0.80 million Btu of operating energy, resulting in an electrical energy savings of 0.41 million Btu.

OBSERVATIONS

Problems existed with liquid flow sensors in both the DHW and space heating loops. In the latter case a fall-back position to the air side of the space

heating subsystem was possible. However, the problem did invalidate many DHW and storage performance factors. Additional anomalies in the DHW subsystem loop should be noted. The DHW pump remained on too long and this resulted in some energy being removed from the DHW subsystem and returned to storage. The actual amount was unmeasured, but believed to be relatively small. Also, there was an unmeasured storage energy loss due to a slight water seepage from the storage tank.

ENERGY SAVINGS

The space heating subsytem contributed an electrical energy savings of 0.41 million Btu.

III. ACTION STATUS

A new storage tank is to be installed. The operation of the flow sensors in the DHW and space heating loops are to be investigated during the next site visit by Boeing. The system designer is investigating pump operation in the DHW loop.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: CHESTER WEST — SOLAR/1030-79/01
REPORT PERIOD: JANUARY,1979

SITE/SYSTEM DESCRIPTION:
THE CHESTER WEST SITE IS A THREE-BEDROOM TWO-STORY SINGLE FAMILY DWELLING OF APPROXIMATELY 2300 SQUARE FEET OF LIVING AREA. THE SOLAR SYSTEM USES ROOF MOUNTED FLAT PLATE COLLECTORS. A MIXTURE OF ANTIFREEZE AND WATER SERVES AS THE COLLECTOR-TO-STORAGE HEAT TRANSPORT FLUID. HEAT STORAGE IS A 500 GALLON TANK OF WATER LOCATED IN THE GARAGE. THE SOLAR SYSTEM SERVICES DHW PREHEAT AND SPACE HEATING NEEDS OF THE DWELLING FROM STORAGE ONLY. AUXILIARY SPACE HEATING IS PROVIDED BY A HEAT PUMP AND RESISTANCE HEATING COMBINATION.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	5.077 MILLION BTU
	22565 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	1.985 MILLION BTU
	8821 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	34 DEGREES F
AVERAGE BUILDING TEMPERATURE	68 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	*
ECSS OPERATING ENERGY	0.157 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	1.072 MILLION BTU
TOTAL ENERGY CONSUMED	15.208 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.385	13.389	N.A.	13.499 MILLION BTU
SOLAR FRACTION	*	6	N.A.	* PERCENT
SOLAR ENERGY USED	*	0.767	N.A.	* MILLION BTU
OPERATING ENERGY	0.118	0.797	N.A.	1.072 MILLION BTU
AUX. THERMAL ENERGY	0.656	10.809	N.A.	11.465 MILLION BTU
AUX. ELECTRIC FUEL	0.656	11.496	N.A.	12.151 MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
ELECTRICAL SAVINGS	*	0.411	N.A.	* MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.307

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

SITE/SYSTEM DESCRIPTION:
THE CHESTER WEST SITE IS A THREE-BEDROOM TWO-STORY SINGLE FAMILY DWELLING OF APPROXIMATELY 2300 SQUARE FEET OF LIVING AREA. THE SOLAR SYSTEM USES ROOF MOUNTED FLAT PLATE COLLECTORS. A MIXTURE OF ANTIFREEZE AND WATER SERVES AS THE COLLECTOR-TO-STORAGE HEAT TRANSPORT FLUID. HEAT STORAGE IS A 500 GALLON TANK OF WATER LOCATED IN THE GARAGE. THE SOLAR SYSTEM SERVICES DHW PREHEAT AND SPACE HEATING NEEDS OF THE DWELLING FROM STORAGE ONLY. AUXILIARY SPACE HEATING IS PROVIDED BY A HEAT PUMP AND RESISTANCE HEATING COMBINATION.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	5.356 GIGA JOULES
	256250 KJ/SQ.M.
COLLECTED SOLAR ENERGY	2.094 GIGA JOULES
	100174 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	1 DEGREES C
AVERAGE BUILDING TEMPERATURE	20 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	N.A.
ECSS OPERATING ENERGY	0.166 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	1.131 GIGA JOULES
TOTAL ENERGY CONSUMED	16.045 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.406	14.125	N.A.	14.242 GIGA JOULES
SOLAR FRACTION	*	6	N.A.	* PERCENT
SOLAR ENERGY USED	*	0.809	N.A.	* GIGA JOULES
OPERATING ENERGY	0.124	0.841	N.A.	1.131 GIGA JOULES
AUX. THERMAL ENG	0.692	11.404	N.A.	12.095 GIGA JOULES
AUX. ELECTRIC FUEL	0.692	12.128	N.A.	12.820 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	*	0.433	N.A.	* GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.307

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REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	0.010	50	*	N	0.000	N	*
2	0.201	19	*	O	0.019	O	*
3	0.462	20	*	T	0.025	T	*
4	0.318	29	*		0.009		*
5	0.034	35	*	A	0.000	A	*
6	0.005	43	*	P	0.000	P	*
7	0.019	45	*	P	0.000	P	*
8	0.230	21	*	L	0.006	L	*
9	0.483	20	*	I	0.012	I	*
10	0.372	27	*	C	0.011	C	*
11	0.140	28	*	A	0.005	A	*
12	0.058	43	*	B	0.001	B	*
13	0.030	44	*	L	0.000	L	*
14	0.062	24	*	E	0.000	E	*
15	0.419	27	*		0.012		*
16	0.032	41	*		0.000		*
17	0.040	50	*		0.001		*
18	0.309	45	*		0.011		*
19	0.021	42	*		0.000		*
20	0.015	44	*		0.000		*
21	0.015	33	*		0.000		*
22	0.275	32	*		0.007		*
23	0.254	40	*		0.007		*
24	0.068	26	*		0.000		*
25	0.407	24	*		0.010		*
26	0.089	35	*		0.003		*
27	0.012	36	*		0.000		*
28	0.044	29	*		0.000		*
29	0.340	30	*		0.012		*
30	0.227	34	*		0.006		*
31	0.087	28	*		0.001		*
SUM	5.077	-	*	N.A.	0.157	N.A.	-
AVG	0.164	34	*	N.A.	0.005	N.A.	*
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	0.010	0.000	0.000	54	0.000
2	0.201	0.157	0.015	*	0.073
3	0.462	0.461	0.199	25	0.430
4	0.318	0.295	0.165	39	0.520
5	0.034	0.000	0.000	36	0.000
6	0.005	0.000	0.000	40	0.000
7	0.019	0.001	0.001	52	0.058
8	0.230	0.153	0.075	22	0.328
9	0.483	0.447	0.226	29	0.468
10	0.372	0.348	0.193	38	0.519
11	0.140	0.087	0.041	33	0.291
12	0.058	0.017	0.009	44	0.159
13	0.030	0.000	0.000	44	0.000
14	0.062	0.000	0.000	22	0.000
15	0.419	0.389	0.199	33	0.475
16	0.032	0.000	0.000	43	0.000
17	0.040	0.008	0.006	54	0.142
18	0.309	0.290	0.157	50	0.506
19	0.021	0.000	0.000	43	0.000
20	0.015	0.000	0.000	43	0.000
21	0.015	0.000	0.000	31	0.000
22	0.275	0.241	0.124	34	0.453
23	0.254	0.211	0.107	44	0.422
24	0.068	0.000	0.000	24	0.000
25	0.407	0.365	0.190	31	0.466
26	0.089	0.029	0.016	39	0.180
27	0.012	0.000	0.000	38	0.000
28	0.044	0.000	0.000	29	0.000
29	0.340	0.307	0.154	35	0.452
30	0.227	0.188	0.104	43	0.459
31	0.087	0.010	0.004	30	0.048
SUM	5.077	4.005	1.985	-	-
AVG	0.164	0.129	0.064	37	0.391
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: CHESTER WEST SOLAR/1030-79/01
REPORT PERIOD: JANUARY,1979

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.000	*	-0.012	80	*
2	0.001	*	-0.017	81	*
3	0.175	*	0.031	84	*
4	0.151	*	0.001	91	*
5	0.000	*	-0.019	80	*
6	0.000	*	-0.013	77	*
7	0.001	*	-0.009	74	*
8	0.068	*	0.060	80	*
9	0.209	*	-0.008	99	*
10	0.180	*	-0.010	94	*
11	0.035	*	0.023	86	*
12	0.007	*	-0.008	88	*
13	0.000	*	-0.019	84	*
14	0.000	*	-0.013	80	*
15	0.184	*	0.010	91	*
16	0.000	*	-0.013	81	*
17	0.004	*	-0.004	77	*
18	0.146	*	0.049	90	*
19	0.000	*	-0.031	83	*
20	0.000	*	-0.011	80	*
21	0.000	*	-0.018	77	*
22	0.116	*	0.028	81	*
23	0.099	*	0.003	86	*
24	0.000	*	-0.021	81	*
25	0.175	*	0.024	89	*
26	0.012	*	0.004	84	*
27	0.000	*	-0.022	82	*
28	0.000	*	-0.015	78	*
29	0.141	*	0.023	84	*
30	0.096	*	0.010	86	*
31	0.002	*	-0.005	83	*
SUM	1.802	*	0.001	-	-
AVG	0.058	*	0.000	84	*
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	0.028	*	*	0.002	0.033	0.033	N	*	N	62	140	40
2	0.039	*	*	0.005	0.047	0.047	O	*	O	50	140	52
3	0.018	*	*	0.009	0.025	0.025	T	*	T	52	140	25
4	0.042	*	*	0.009	0.036	0.036		*		54	140	57
5	0.052	*	*	0.006	0.052	0.052	A	*	A	57	140	72
6	*	*	*	0.002	0.035	0.035	P	*	P	56	140	*
7	*	*	*	0.002	0.039	0.039	P	*	P	53	140	*
8	*	*	*	0.002	0.015	0.015	L	*	L	53	140	*
9	*	*	*	0.007	0.015	0.015	I	*	I	53	140	*
10	0.001	*	*	0.011	0.013	0.013	C	*	C	52	140	1
11	0.003	*	*	0.003	0.012	0.012	A	*	A	52	140	4
12	0.000	*	*	0.000	0.012	0.012	B	*	B	54	140	1
13	0.003	*	*	0.001	0.013	0.013	L	*	L	56	140	4
14	0.000	*	*	0.000	0.013	0.013	E	*	E	46	140	0
15	0.000	*	*	0.004	0.012	0.012		*		50	140	0
16	0.010	*	*	0.000	0.015	0.015		*		54	140	13
17	0.006	*	*	0.001	0.016	0.016		*		58	140	9
18	0.014	*	*	0.006	0.017	0.017		*		60	140	20
19	0.002	*	*	0.004	0.013	0.013		*		56	140	3
20	0.008	*	*	0.000	0.019	0.019		*		54	140	11
21	0.016	*	*	0.002	0.026	0.026		*		52	140	22
22	0.028	*	*	0.004	0.029	0.029		*		52	140	37
23	0.003	*	*	0.005	0.015	0.015		*		54	140	9
24	0.011	*	*	0.001	0.018	0.018		*		48	140	14
25	0.004	*	*	0.007	0.015	0.015		*		50	140	5
26	0.000	*	*	0.002	0.012	0.012		*		53	140	0
27	0.015	*	*	0.002	0.020	0.020		*		51	140	19
28	0.012	*	*	0.001	0.020	0.020		*		48	140	16
29	0.013	*	*	0.005	0.021	0.021		*		50	140	17
30	0.003	*	*	0.012	0.013	0.013		*		55	140	3
31	0.004	*	*	0.005	0.014	0.014		*		50	140	5
SUM	0.385	-	*	0.118	0.656	0.656	N.A.	*	N.A.	-	-	522
AVG	0.012	*	*	0.004	0.021	0.021	N.A.	*	N.A.	53	140	17
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.208	0	0.000	0.009	0.211	0.214	N	0.000	N	72	50
2	0.822	2	0.018	0.036	0.809	0.821	O	0.013	O	70	19
3	0.465	17	0.077	0.031	0.390	0.396	T	0.051	T	68	20
4	0.381	17	0.066	0.026	0.316	0.319		0.032		68	29
5	0.591	0	0.000	0.025	0.595	0.604	A	0.000	A	71	35
6	0.347	0	0.000	0.015	0.348	0.351	P	0.000	P	69	43
7	0.323	0	0.000	0.015	0.323	0.323	P	0.000	P	70	45
8	0.749	0	0.000	0.031	0.749	0.749	L	0.000	L	68	21
9	0.547	20	0.108	0.032	0.440	0.440	I	0.070	I	68	20
10	0.415	24	0.100	0.030	0.315	0.315	C	0.057	C	68	27
11	0.609	0	0.000	0.025	0.609	0.609	A	0.000	A	69	28
12	0.530	0	0.000	0.024	0.530	0.530	B	0.000	B	70	43
13	0.313	0	0.000	0.014	0.313	0.313	L	0.000	L	68	44
14	0.653	0	0.000	0.027	0.653	0.653	E	0.000	E	66	24
15	0.407	22	0.089	0.028	0.318	0.318		0.043		67	27
16	0.422	0	0.000	0.018	0.422	0.422		0.000		67	41
17	0.240	0	0.000	0.011	0.240	0.240		0.000		68	50
18	0.116	35	0.041	0.010	0.073	0.073		0.016		69	45
19	0.429	3	0.013	0.028	0.293	0.330		0.005		69	42
20	0.390	0	0.000	0.021	0.208	0.259		0.000		69	44
21	0.431	0	0.000	0.028	0.232	0.292		0.000		69	33
22	0.297	13	0.039	0.026	0.131	0.170		0.019		68	32
23	0.359	14	0.050	0.030	0.152	0.197		0.019		69	40
24	0.543	0	0.000	0.035	0.326	0.396		0.000		66	26
25	0.427	18	0.076	0.033	0.228	0.271		0.044		66	24
26	0.333	0	0.000	0.026	0.155	0.210		0.000		67	35
27	0.360	0	0.000	0.027	0.180	0.236		0.000		67	36
28	0.474	0	0.000	0.031	0.289	0.350		0.000		68	29
29	0.345	15	0.051	0.031	0.183	0.225		0.027		67	30
30	0.268	14	0.039	0.031	0.171	0.206		0.016		68	34
31	0.594	0	0.000	0.045	0.608	0.664		0.000		67	28
SUM	13.389	-	0.767	0.797	10.809	11.496	N.A.	0.411	N.A.	-	-
AVG	0.432	6	0.025	0.026	0.349	0.371	N.A.	0.013	N.A.	68	34
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: CHESTER WEST
REPORT PERIOD: JANUARY,1979

SOLAR/1030-79/01

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	43	N	50	54	N	N	N
2	895	O	19	*	O	O	O
3	2051	T	20	25	T	T	T
4	1412		29	39			
5	149	A	35	36	A	A	A
6	23	P	43	40	P	P	P
7	84	P	45	52	P	P	P
8	1022	L	21	22	L	L	L
9	2147	I	20	29	I	I	I
10	1653	C	27	38	C	C	C
11	622	A	28	33	A	A	A
12	256	B	43	44	B	B	B
13	132	L	44	44	L	L	L
14	277	E	24	22	E	E	E
15	1863		27	33			
16	143		41	43			
17	176		50	54			
18	1374		45	50			
19	93		42	43			
20	67		44	43			
21	69		33	31			
22	1222		32	34			
23	1128		40	44			
24	302		26	24			
25	1810		24	31			
26	394		35	39			
27	55		36	38			
28	195		29	29			
29	1510		30	35			
30	1010		34	43			
31	386		28	30			
SUM	22565	N.A.	-	-	-	-	-
AVG	728	N.A.	34	37	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

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